UNIT 1 - REVIEW

Unit Objectives:

After completing this unit, the student should be able to:

1) Recognize and use ther following systems of nomeclature: IUPAC, -ous/-ic and Greek prefix methods.

2) For binary compounds, simple acids and bases, gaseous elements, oxy-acids, salts of compound ions, acid salts and hydrates:
   a) Write the name of a compound given its formula.
   b) Write the formula of a compound given its name.

3) Write the name and formula of other common compound ions.

4) Express the answer to a calculation with the correct number of significant digits.

5) Calculate the molar mass of a compound from its chemical formula.

6) Calculate the percentage composition by mass of a compound.

7) Solve problems involving moles, mass and molar mass.

8) Solve problems involving moles, Avogadro's number and number of atoms or molecules.

9) Solve gas law problems involving volume, pressure, temperature, density and molar mass.

10) Balance chemical equations by inspection.

11) Perform stoichiometric calculations involving balanced chemical equations.

12) Perform concentration calculations involving moles per litre or percentage by mass.

NOMENCLATURE - COMMON VALENCES OF SOME ELEMENTS

For most elements, the valence that you need to know can be determined from the position of the element in the Periodic Table. For the elements where this does not work, the valences that you should know in the table below.

It should be noted that the valences listed in the table below and those deduced from the Periodic Table are the common valences for these elements. Other valences do exist but, for the purposes of this course, it is not necessary for you to know them.

ELEMENT	SYMBOL	COMMON VALENCE(S)	
hydrogen	H	+1,-1	
silver	Ag	+1	
cadmium	Cd	+2	
zinc	Zn	+2	
copper	Cu	+1,+2	
mercury	Hg	+1,+2	
gold	Au	+1,+3	
cobalt	Co	+2,+3	
iron	Fe	+2,+3	
nickel	Ni	+2,+3	
tin	Sn	+2,+4	
lead	Pb	+2,+4	
manganese	Mn	+2,+4	
nitrogen	N	+3,+5,-3	
phosphorus	P	+3,+5,-3	
arsenic	As	+3,+5,-3	Group 15 (VA)
antimony	Sb	+3,+5,-3	Elements
bismuth	Bi	+3,+5,-3	
sulfur	S	+4 +6,-2	

NOMENCLATURE

- OUS-IC NAMES FOR SOME IONS

Element	-Ous-ic Names
Copper	+1 - cuprous ; +2 - cupric
Mercury	+1 - mercurous ; +2 - mercuric
Iron	+2 - ferrous ; +3 - ferric
Tin	+2 - stannous ; +4 -stannic
Lead	+2 - plumbous; +4 - plumbic
Manganese	+2 - manganous ; +4 - manganic
Phosporus	+3 - phosphorous ; +5 - phosphoric
Arsenic	+3 - arsenous ; +5 - arsenic
Antimony	+3 - antimonous ; +5 - antimonic

COMMON COMPOUND IONS

NH_4^+	ammonium ion *
MnO_4^-	permanganate ion
CrO_4^{2-}	chromate ion
$Cr_2O_7^{2-}$	dichromate ion
CN^-	cyanide ion
SCN^-	thiocyanate ion
CH_3COO^-	acetate ion

* Note: NH_3 is ammonia. It is a neutral compound,not a compound ion.

SCH3U

Compound (Polyatomic) Ions: Names & Formulas

Hypo - - ite							
- - ite							
- - ate							
Per - - ate							

Oxy-Acids: Names & Formulas

Hypo - - ous Acid							
- - ous Acid							
- - ic Acid							
Per - - ic Acid							

NOMENCLATURE REVIEW

Chemical compounds can be divided into two main categories:

i) Organic Compounds: hese compounds contain carbon, hydrogen and possibly other elements such as oxygen or nitrogen.
ii) Inorganic Compounds: All other compounds are placed in this category.

In this course, we will mainly be dealing with inorganic compounds in units 2 – 6. Unit 7 deals with organic chemistry. The purpose of this nomenclature review is to refresh your memory with respect to the inorganic nomenclature that you learned in Grade 11 Chemistry.

1) BINARY COMPOUNDS:

- A binary compound contains two elements (three when NH_4^+ is in it).
- In a binary compound, the first element has a positive valence and the second element has a negative valence.
- When writing names of binary compounds, the ending of-the second element is changed to -ide (except when dealing with binary acids)..
- When writing the formula of a binary compound, the subscripts are reduced to the simplest whole number ratio.

a) Simple Binary Compounds
In a simple binary compound, each element has only one common valence.

calcium bromide _____ aluminium nitride _____

Li_2O _____ Ca_2C _____

b) IUPAC Method

- This method is used when the first element of a compound has more than one common positive valence.
- A Roman numeral indicates the valence of the first (often metallic) element.

Tin (IV) chloride _____ sulphur(VI) oxide _____

$PbBr_2$ _____ FeO _____

c) Greek Prefic Method

- This method is used when the first element of a compound has more than one common positive valence.
- A Greek prefix is placed in front of each element to indicate how many atoms of each element are in the compound.
- An exception to this is that the mono- prefix is not placed in front of the first element if there is only one atom of that element in the compound.

1 - mono	3 - tri	5 - penta	7 - hepta	9 - nona
2 - di	4 - tetra	6 - hexa	8 - octa	10 - deca

diarsenic trisulfide _____ carbon tetrachloride _____

SO_2 _____ CO _____

d) –ous / –ic Method

- This method is used when the first element of a compound has more than one common positive valence.
- An -ous ending indicates that the element has the lower positive valence.
- An -ic ending indicates that the element has the higher positive valence. (See reference sheet)
- Root names are often derived from the archain names of the elements (e.g. cuprum, ferrum).

ferric chloride _____ arsenous oxide _____

cuprous oxide _____ $PbBr_4$ _____

HgCl _____ P_3N_5 _____

e) Peroxides

- A peroxide has one more oxygen atom than the normal binary oxide.

calcium peroxide _____ Na_2O_2 _____

f) Binary Acids

- In a binary acid, the first element is always hydrogen.
- The name of a binary acid always begins with hydro- and ends with -ic acid.

hydrosulfuric acid _____ HCl _____

2) BASES:

- A base contains one or more hydroxide ions (OH^-)

copper (II) hydroxide _____ NH_4OH _____

3) GASEOUS ELEMENTS:

- The noble gases are monatomic. All other gaseous elements are diatomic.

helium gas _____ chlorine gas _____

4) SALTS OF COMPOUND IONS:

- A salt of a compound ion contains three elements (four if NH_4^+ is in it).
- When writing the name, name the first element using the simple, international or ous-ic method. Then name the compound ion. (See reference sheets)
- When writing the formula, treat the compound ion as if it is one element and do the same as you would with a binary compound.

copper (II) phosphate _____ ammonium nitrate _____

$NaClO_3$ _____ $FeSO_4$ _____

5) OXY-ACIDS:

- An oxy-acid contains three elements.
- The first element is always hydrogen and the last element always oxygen.See

nitric acid _____ HClO _____

6) ACID SALTS:

- An acid salt consists of some element with a positive valence, hydrogen and some compound ion.
- When naming an acid salt, greek prefixes are used if there is more than one atom of hydrogen in it.

sodium hydrogen sulfite _____

magnesium hydrogen carbonate _____

KH_2PO_2 _____

$Ba(HSO_4)_2$ _____

7) HYDRATES:

- A hydrate is a compound which has water molecules in its structure.
- The formula of a hydrate has two parts separated by a dot. The first part is either a binary compound or the salt of a compound ion. The second part consists of a number of water molecules.
- When writing the name of a hydrate, the first part is named using the previously outlined methods. The second part is named using a greek prefix and the word hydrate.

copper (II) sulfate pentahydrate _____

$Na_2CO_3 \bullet 10\ H_2O$ _____

EXERCISE SHEET #1

Write the formula or name for each of the following:

GREEK PREFIX METHOD

carbon dioxide_____ tin monoxide _____

diarsenic pentoxide _____ manganese dioxide _____

phosphorus trichloride _____ sulfur hexachloride _____

diantimony trisulfide _____ sulphur trioxide _____

CuCl _____ ____ As_2S_5 _____

Mg_3N_2 _____ PbO _____

SIMPLE BINARY COMPOUNDS

sodium oxide _____ magnesium bromide _____

calcium hydride _____ potassium iodide _____

zinc oxide _____ silver oxide _____

silver sulfide _____ hydrogen oxide _____

lithium fluoride _____ barium sulfide _____

aluminum carbide _____ silicon oxide _____

cadmium chloride _____ magnesium nitride _____

IUPAC METHOD

mercury (I) chloride_____ nickel (II) oxide _____

gold (III) iodide _____ phosphorus (V) oxide _____

tin(II) oxide _____ copper (II) bromide _____

As_2S_5 _____ PbO _____

Fe_2O_3 _____ CuI_2 _____

MnO_2 _____ P_2O_3 _____

OUS-IC METHOD

mercurous chloride _____ ferric oxide _____

stannic fluoride _____ phosphorous oxide _____

$SnCl_4$ _____ Sb_2O_3 _____

$CuBr_2$ _____ FeI_2 _____

As_2S_5 _____ HgI _____

EXERCISE SHEET #2

Write the formula or name for each of the following:
(Use the IUPAC Method if needed)

SALTS OF COMPOUND IONS

silver phosphate _____ KNO_3 _____

sodium sulfite _____ Na_2SO_4 _____

magnesium phosphite _____ $Ca_3(PO_4)_2$ _____

calcium sulfate _____ $CuSO_3$ _____

iron (III) sulfate _____ Na_3PO_4 _____

potassium nitrate _____ $Mg_3(PO_4)_2$ _____

calcium phosphate _____ Cu_2SO_3 _____

manganese (IV) nitrate _____ $Ca_3(PO_3)_2$ _____

calcium carbonate _____ K_3PO_4 _____

sodium phosphate _____ $MnCO_3$ _____

sodium nitrite _____ $FePO_2$ _____

cupric sulfate _____ $NaNO_3$ _____

lithium nitrate _____ K_2SO_4 _____

cesium phosphate _____ $Ba_3(PO_4)_2$ _____

mercurous sulphite _____ Na_2SO3 _____

manganese(IV) nitrate _____ $Ba(NO_3)_2$ _____

aluminum sulfate _____ $MnSO_4$ _____

antimony(III) nitrite _____ $Fe_2(SO_4)_3$ _____

lead(IV) nitrate _____ $Sn(NO_2)_2$ _____

$Fe(NO_3)_2$ _____ $AlPO_4$ _____

$Ca_3(PO_2)_2$ _____ $MgSO_3$ _____

$FeSO_3$ _____ Hg_2SO_4 _____

$BeCO_3$ _____ $Ni_3(PO_3)_2$ _____

EXERCISE SHEET #3 - NOMENCLATURE - ALL TYPES

antimonic oxide _____ K_2SO_4 _____

calcium hypochlorite _____ As_2O_5 _____

sodium chlorite_____ NaClO _____

sodium nitrate _____ $Zn(OH)_2$ _____

ferric periodate _____ NH_3 _____

potassium cyanide _____ $AlPO_4$ _____

magnesium perchlorate _____ $CoSO_4$ _____

barium sulfide _____ BaO_2 _____

sodium hydrogen carbonate _____ $(NH_4)_2CO_3$ _____

potassium peroxide _____ $MgSO_3$ _____

hydrosulphuric acid _____ N_2 _____

hydrogen fluoride _____ SO_3 _____

lead(IV) chromate _____ NaSCN _____

chlorine gas _____ FeS _____

hypochlorous acid _____ SnS_2 _____

cadmium hydroxide _____ $CaHPO_4$ _____

aluminum sulfate _____ NH_4ClO _____

lead(II) chlorite _____ Fe_2O_3 _____

arsenic(V) nitride _____ Cu_2S _____

manganous acetate _____ HBr _____

antimony (III) nitrite _____ $Fe(OH)_2$ _____

lead (IV) nitrate _____ H_2O_2 _____

chlorous acid _____ $NaHSO_4$ _____

hydrochloric acid _____ H_2SO_4_____

nickel(III) iodite _____ $Au(ClO_4)_3$ _____

sodium hydrogen hypophosphite _____

EXERCISE SHEET #4 - NOMENCLATURE - ALL TYPES

diantimony trioxide _____ LiCl _____

manganous sulphide _____ Cd_3N_2 _____

phosphorous acid _____ CuH_____

ammonium sulfite _____ $Hg(ClO)_2$_____

tin tetraiodide _____ Sb_2S_3_____

cupric chlorite _____ $K_2Cr_2O_7$ _____

potassium permanganate _____ $AuNO_3$ _____

ferric fluoride _____$Co_2(SO_3)_3$ _____

silver oxide _____Kr _____

potassium thiocyanate _____H_2CO_3 _____

copper(I) nitrite _____HCl(g) _____

nickel(II) bromide _____ PbI_2 _____

zinc bromate _____ NaCN _____

fluorine gas _____ $Fe(BrO_2)_2$ _____

calcium sulfate dihydrate _____ $Cu(OH)_2$ _____

hydroiodic acid _____HBrO _____

mercurous phosphide _____$NaCH_3COO$ _____

sodium chromate _____Ni_4C_3 _____

gold(III) phosphate _____$Sn(ClO_3)_4$ _____

cobalt(II) hydroxide _____ HF (aq) _____

sodium arsenide _____ $(NH_4)_3PO_2$ _____

stannous chloride _____ NCl_3 _____

lead(IV) hypoiodite _____ K_2O_2 _____

calcium perchlorate _____ SO_2 _____

beryllium nitride _____ $Mn(IO_4)_2$ _____

magnesium cyanide_____ $MgSO_4•7H_2O$_____

lithium carbonate _____ K_2HPO_3 _____

Measurement and Significant Digits

You should already be very familiar with the rules of significant digits and how to express your final mathematical answers to a science problem. Below is a brief summary of what you need to know.

1. The last digit of any measure is estimated.

Suppose you measure the length of a pencil and find it to be 28.73 cm long. The 28.7 is certain and the last digit 3 is estimated. The smallest measurement markings on your ruler that you used must have been _____. Someone else making the same measurement **must** agree with 28.7 (the certain digits), however the last digit might vary.

2. All digits in a measurement are significant *except* zeros to the left of non-zero digits.

Therefore the measurement 0.00054 s has _____ significant digits and should be expressed as in scientific notation as _____. The measurement of 1500 m has _____ significant digits and if expressed in scientific notation it would be _____.

Constants such as Avogadro's number, molar masses and the heat capacity of water are actually measurements and are not exact. When these constants are used the rules for significant digits do apply. Counted values (e.g. 4 atoms of sulfur) are exact and are not considered to have significant digits.

3. Rule for addition and subtraction.
The final answer of a calculation involving addition or subtraction must have the same number of decimals as the number in the computation that has the fewest number of decimals.

Example: 4.877 m+ 1018.7 m =

Remember that your answer can only be as good as you least precise piece of data!

4. Rule for multiplication and division.
The final answer of a calculation involving and multiplication or division must have the same number of significant digits as the number in the computation that has the fewest number of significant digits.

Example: 78.4 m x 2475.3 m =

CALCULATIONS REVIEW 1

1) MOLAR MASS AND % COMPOSITION:

a) Calculate the molar mass of $B_2(CO_3)_3$

b) Calculate the % composition (by mass) of $B_2(CO_3)_3$.

2) COMBINED GAS LAW PROBLEMS:

Note:

- STP stands for standard temperature and pressure. Standard temperature= 0°C = 273K
- Standard pressure= 101.3 kPa = 1 atm = 760 mm = 760 Torr

a) A gas occupies a volume of 25.4 L at STP. What would be the volume of the gas at 600 kPa and -15°C?

3) i) GAS LAWS AND MOLAR VOLUME:

Note:

- 1 L = 1000 mL 1 mL = 1 cm^3
- One mole of any gas occupies 22.4 L at STP.

a) 0.842 g of a gas occupies 450 cm^3 at 100 kPa and 100^oC. What is the molar mass of the gas?

i

i) THE IDEAL GAS LAW (*R* = 8.314 kPa·L/mol·K)

Determine the mass of a sample of xenon gas if the gas has a volume of 1.0 L at 25^{o}C and 103.5 kPa.

4) MOLE CONCEPTS

a) How many moles of CO_2 are present in 11 g of carbon dioxide gas?

b) How many moles of water molecules are present in 1.00 L of liquid water?

c) How many molecules of water are present in 1.00 L of water?

d) How many atoms of hydrogen are present in 1.00 L of water?

5) STOICHIOMETRY:

Potassium chlorate decomposes into potassium chloride and oxygen gas.
a) Write a balanced chemical equation for the reaction.

b) What mass of potassium chloride can be produced from the decomposition of 11.2 g of potassium chlorate?

c) What volume of oxygen gas would be produced from the decoposition of 11.2 g of potassium chlorate?

6) CONCETRATION AND DILUTION PROBLEMS

a) mol/L (M) — What is the concentration in mol/L of a solution prepared by dissolving 49 g of sulfuric acid in enough water to produce a 3.0 L solution?

b) % by mass — A solution is prepared by dissolving 115 g of sugar in 155 g of water. Express its concentration as a percentage by mass.

CALCULATIONS REVIEW PROBLEMS

1) Calculate the molar mass of a) H_2SO_4 b) $Al_2(SO_4)_3$

2) Calculate the % composition of a) BaO_2 b) KHC_2O_4

3) A given mass of a gas occupies a volume of 8.4 L at a pressure of 101 kPa. What would its volume be at a pressure of 112 kPa? The temperature is kept constant.

4) A given mass of a gas occupies a volume of 4.2 L at a temperature of 0°C. What would its volume be at a temperature of 91°C? The pressure is kept constant.

5) A given mass of a gas occupies a volume of 6.3 L at a pressure of 101 kPa and a temperature of 0°C. What would its volume be at a pressure of 143 kPa and a temperature of 113°C?

6) What Is the STP volume of a sample of gas which occupies 500 cm^3 at a temperature cf 100°C and a pressure of 200 kPa?

7) A sample of gas whose volume at 27°C Is 127 cm^3 is heated at a constant pressure until its volume becomes 317 cm^3 . What is the final Celsius temperature of the gas?

8) If 91.0 g of a gas occupy 14.0 L at STP, what is the molar mass cf the gas?

9) How many moles of a gas are present in 560 cm^3 of a gas at 500 kPa and 180°C?

10) What is the molar mass of a compound if 560 cm^3 has a mass of 1.10 g at STP?

11) Calculate the mass of 1.51×10^{24} molecules of carbon dioxide.

12) a) How many molecules are in 11.5 g of magnesium chloride?
b) How many <u>atoms</u> are in 11.5 g of magnesium chloride?

Answers:

1) a) 98.1 g/mol b) 342.3 g/mol
2) a) Ba 81.10%; O 18.90%
b) K 30.5%; H 0.788%; C 18.7%; O 50.0%
3) 7.6 L
4) 5.6 L
5) 6.3 L
6) 723 cm^3
7) 476^oC
8) 146 g/mol
9) 0.0743 mol
10) 44.0 g/mol
11) 110 g
12) a) 7.26×10^{22}
b) 2.18×10^{23}

13) In the reaction $2S(s) + 3O_2(g) \longrightarrow 2SO_3(g)$, how many moles of sulfur will react with 9 moles of oxygen gas?

14) $CH_4(g) + 2O_2(g) \longrightarrow C0_2(g) + 2H_2O(g)$
How many grams of 02(g) are needed to react with 6.4 g of CH 4(g)?

15) How many grams of nitrogen dioxide will be produced when 128 g of oxygen gas react completely with nitrogen monoxide?

16) Sodium carbonate and hydrochloric acid react to give sodium chloride, carbon dioxide and water. How many grams of hydrochloric acid would be required to produce 286 g of carbon dioxide?

17) $Zn + H_2SO_4 \longrightarrow ZnSO_4 + H_2(g)$
How many grams of zinc are required to prepare 6.00 L of hydrogen gas at STP?

18) $2Al_2O_3 \longrightarrow 4Al + 3O_2(g)$
What volume of oxygen at STP is obtained by decomposition of 40.8 g of aluminum oxide?

19) $4NH_3 + 5O_2(g) \longrightarrow NO(g) + 6H_2O(g)$
What volume of oxygen gas at STP is required to react with 1.00 mole of ammonia?

20) $Zr + 2Cl_2(g) \longrightarrow ZrCl_4(g)$
What mass of Zr would be required to produce 200.cm3 of ZrC14(s) at 350°C and 50.0 kPa?

21) What is the concentration in mol/L of a solution that contains 39.2g of H_3PO_4 in 500 cm^3 of solution?

22) What is the concentration in mol/L of a solution that contains 100g of Na_2SO_4 in 10.0 L of solution?

23) How many grams of copper(II) sulfate pentahydrate are required to prepare 2.0 L of a 3.0 mol/L solution?

24) What volume of 1.5 mol/L calcium chlorate solution would contain 25g of calcium chlorate?

25) 12.24g of a solution contains 0.98g of sodium chloride. Express its concer.tration in percentage by mass.

26) What is the mass of sodium bromide in 15g of a 25% solution?

Answers:

13) 6 mol	18) 13.4 L	23) 1.5×10^3 g
14) 26 g	19) 28.0 L	24) 0.080 L
15) 368 g	20) 0.176 g	25) 8.0%
16) 474 g	21) 0.800 mol/L	26) 3.8 g
17) 17.5 g	22) 0.0704mol/L	

UNIT 1 REVIEW

1. What is the percent composition of: a) sodium carbonate?
b) aluminum oxide?

2. Calculate the mass of 1.00 L of carbon dioxide gas at STP.

3. What is the molar mass of a gas if 2.1g occupy 992 mL at 21°C and 99.3 kPa?

4. How many grams of lead(II) chloride will be produced when 6.7 g of lead(II) nitrate react with hydrochloric acid to form nitric acid and lead(II) chloride?

5. Molten sodium chloride decomposes when an electrical current is passed through it. How many millilitres of chlorine gas will be produced at 500°C and 101.3 kPa by 1.00 g of sodium chloride?

6. A reaction involved in the production of iron from iron ore is

$$Fe_2O_3 + CO \longrightarrow Fe + CO_2$$

a) How many grams of CO must react to produce 3.50 kg of Fe?
b) What volume, at STP, of CO_2 would be produced?

ANSWERS	
1.	Na 43.4%, C 11.3%, 0 45.3%
2.	1.96 g
3.	52 g/mol
4.	5.6 g
5.	542 mL
6.	a) 2.6 kg b) 2.1 x 10^3L

NOMENCLATURE - ALL TYPES

Write the chemical formula or name for each of the following.

sodium hydrogen carbonate_____	H_2O_2 _____
potassium oxide_____	$KHSO_3$ _____
hydrosulphuric acid _____	Na_2SO_3 _____
manganous chlorite _____	$NaClO_3$ _____
hydrogen iodide _____	$CaHPO_4$ _____
sodium hydrogen phosphate _____	HBr _____
ferrous chloride _____	$Ba(NO_3)_2$ _____
iron (III) nitrate _____	$Na_2CO_3 \bullet 10H_2O$ _____
sulfur trioxide _____	$MnSO_4$ _____
potassium peroxide _____	$PbCl_4$ _____
lead (II) perchlorate _____	$NaHCO_3$ _____
carbon tetrachloride _____	Hg_2SO_4 _____
sulfurous acid _____	$HClO_2$ _____
calcium hypochlorite _____	$NaIO_4$ _____
zinc sulfate _____	PCl_3 _____
lead (IV) oxide _____	N_2O_3 _____
silicon dioxide _____	$CaCO_3$ _____
hypobromous acid _____	KNO_3 _____
calcium chloride dihydrate _____	$Al(OH)_3$ _____
mercury (I) iodide _____	$SnCl_2$ _____
phosphorus (III) oxide _____	Sb_2S_5 _____
magnesium sulfate heptahydrate	NH_3 _____
_____	Na_2O_2 _____
arsenic (V) oxide _____	$Ca(HCO_3)_2$ _____
stannic chloride _____	NaH_2PO_4 _____
ammonium sulfate _____	$Fe_2(SO_4)_3$ _____

NOMENCLATURE - ALL TYPES - Part 2

Write the chemical formula or name for each of the following.

barium hydroxide _____

potassium bromite _____

silver nitrate _____

potassium carbonate _____

perchloric acid _____

manganese dioxide _____

potassium peroxide _____

sodium oxide _____

magnesium nitride _____

sodium sulphite _____

iodous acid _____

zinc oxide _____

aluminum hydroxide _____

potassium hydrogen sulfate _____

copper (II) nitride _____

ammonium hypophosphite _____

mercurous sulfate _____

plumbous nitride _____

antimony (III) chloride _____

calcium bromite _____

copper(II) sulfate pentahydrate

_____

tin (II) carbonate _____

barium peroxide _____

hydrogen gas _____

hydrosulfuric acid _____

K_2HPO_3 _____

Cu_2O _____

$AsBr_3$ _____

$HClO_4$ _____

$HgCl_2$ _____

$Fe(NO_3)_2$ _____

$Sb(BrO_4)_5$ _____

KBrO _____

Fe_2O_3 _____

$Hg(BrO)_2$ _____

$As\ Cl_3$ _____

KNO_2 _____

SO_3 _____

H_3PO_2 _____

$(NH_4)_3PO_3$ _____

Ag_2S _____

$Mg(OH)_2$ _____

$HClO_4$ _____

$SnCl_4$ _____

$CaSO_4 \bullet 2H_2O$ _____

HNO_3 _____

HI (g) _____

HI (aq) _____

$Cu(IO_2)_2$ _____

$Al_2(SO_3)_3$ _____

CS_2 _____